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Postoperative Limited Volume Irradiation in a Child With a Solitary Brain Metastasis From Wilms Tumor: A Case Report

R.D. Kortmann, MD,[1]* W. Budach, MD,[1] D. Niethammer, MD,[2] E.H. Grote, MD,[3] and M. Bamberg, MD[1]

An 11-year-old boy presented with a solitary cerebral metastasis 2.5 years after initial diagnosis and 4 months after successful combined modality treatment of a stage II recurrent Wilms tumor in the chest. Resection of the brain metastasis was followed by limited volume irradiation with 30.0 Gy total dose. After a follow-up of 2.5 years the boy is in complete remission and shows no neurological or neuropsychological deficits indicating the possibility of curative postoperative radiotherapy of low toxicity and restricted to the tumor site in the presence of solitary brain metastases.
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Key words: Wilms tumor; brain metastases; radiotherapy; late effects

INTRODUCTION

Solitary cerebral metastases are a rare complication in Wilms tumor and are usually associated with pulmonary metastases [3]. In the National Wilms' Tumor Studies (NWTS) I–III, only 7 of 2,860 patients (0.24%) developed brain metastases in the course of their disease [3]. Treatment and outcome for these patients was not, however, reported. As the long-term survival rate is as high as 80–90% in metastatic disease of the liver and chest it would seem likely to be valuable to pursue a curative treatment of solitary brain metastases [4,5].

We report a case in which irradiation of the tumor site alone was performed after gross tumor resection of a solitary cerebral metastasis in a young boy who had been successfully treated for recurrent nephroblastoma in the chest. The outcome was assessed 2.5 years after radiotherapy.

CASE REPORT

A 8.5-year-old boy was diagnosed as having a nephroblastoma stage II in the right kidney. Subsequent therapy was performed according to the SIOP 9/Nephroblastoma protocol. Preoperative chemotherapy was given with vincristine on days 1 and 8 parallel to daily applications of dactinomycin for 5 days, followed by transabdominal, transperitoneal nephrectomy, and paraaortic lymph node sampling. There were no postoperative complications reported and chemotherapy was continued in accordance with the protocol guidelines for stage II tumors without regional lymph node involvement. Two years later, during a routine check, pulmonary metastases were found in the right lung. The boy underwent surgery alone. The histopathological report showed lung metastases of the previously diagnosed nephroblastoma. The tumor did not extend beyond surgical margins either microscopically or grossly. However, 3 months later the disease recurred in the mediastinum. Salvage chemotherapy with curative intent was applied consisting of 2 courses of ifosfamide/etoposide and 2 courses of carboplatinum/etoposide. A complete remission was obtained and autologous bone marrow transplantation after high dose chemotherapy (etoposide, melphalan, and carboplatinum) was carried out followed by radiotherapy of the mediastinum (30.0 Gy total dose, 5 times 1.5 Gy/week).

The boy remained free from relapse for 4 months until the disease recurred in the central nervous system (CNS). On admission he presented with symptoms of increased intracranial pressure, complaining of headache, nausea, and vomiting. No seizures occurred. The neurological examination, including investigation of the cerebrospinal fluid (CSF), proved normal. Clinical examination of other systems was also normal.

Magnetic resonance (MR) showed a well-demarcated spherical space occupying lesion in the right frontal lobe, with a surrounding edema. The solid component displayed a size of 5.4 × 5.0 × 5.0 cm. Computed tomography of chest and abdomen ruled out recurrent disease outside the CNS.

[1]Department of Radiotherapy, University of Tübingen, Tübingen, Germany; [2]Department of Pediatrics, University of Tübingen, Tübingen, Germany; [3]Department of Neurosurgery, University of Tübingen, Tübingen, Germany.

*Correspondence to: Dr. R.D. Kortmann, Department of Radiotherapy, University of Tübingen, Hoppe-Seyler-Str. 3, D-72076 Tübingen, Germany.

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Surgery/Radiation Therapy

A right frontotemporal craniotomy was performed. A well-demarcated gray white tumor, 5 cm in diameter, was found on the surface of the brain. Gross tumor resection was carried out. No postoperative complications occurred and the boy made a good recovery. The histological pattern was typical for nephroblastoma and could be classified as having a favorable histology. The appearance was identical to that of the renal tumor removed 2.5 years earlier.

For radiotherapy computer-assisted treatment planning was performed encompassing the site of the tumor as seen on the preoperative MR with a safety margin of 2 cm; 1.5 Gy was given once daily, 5 times/week, to a total dose of 30.0 Gy administered with a linear accelerator at an energy of 6 MV photons. Radiation therapy was well tolerated without acute neurotoxicity.

Follow-Up

Two and one half years after radiotherapy of the tumor region the boy is still in complete remission assessed by chest X-ray films, ultrasound of the abdomen, and MR of the brain. Neurological examination proved normal. No endocrinological disorders were observed during follow-up. Since end of therapy the boy has completed elementary school without any special educational aid and is presently attending secondary school in the normal class for his age group. His achievements are above average. His everyday activities and social contacts are reported to be normal and no behavioral disturbances have been observed.

DISCUSSION

With combined modality treatment nephroblastoma can be cured in metastatic disease of the chest [4]. There are only 4 case reports in the literature of solitary brain metastases. They are usually associated with pulmonary metastases because of the pathway of tumor spread [1,7–9]. In our patient, intensive combined modality treatments finally controlled metastatic disease outside the CNS. However, the repeated chemotherapeutic regimens applied were unable to prevent a cerebral metastasis. Gross tumor resection and subsequent whole brain irradiation with total doses between 20 and 30 Gy followed by a boost to the primary tumor site between 10 and 15 Gy achieved cure in 4 patients and after successful treatment of pulmonary metastases in 3 patients at a follow-up between 2.5 and 9 years [1,7–9]. Because of the few patients there are no data regarding the appropriate target volume in postoperative radiotherapy. However, the outcome was excellent in the boy we treated with radiotherapy of the tumor site only; 2.5 years after treatment he is in complete remission. Radiotherapy of the whole brain might decrease the full scale IQ, especially in young age and if the doses exceed 24 Gy [2,6]. Additionally, the volume of the restricted treatment field and the anatomical localization impact the risk for late effects. In our patient, radiotherapy has been administered to the right frontal lobe, in an area which is functionally almost silent, and more sensitive regions have been spared. Although detailed neuropsychological testing was not performed, it should be pointed out that our patient is living an active, useful life without overt cognitive dysfunctions. We conclude that restriction of the target volume in postoperative irradiation of the brain in curative therapy of nephroblastoma is valuable. It remains possible that surgery alone is sufficient, but our treatment strategy seems to be safe and should help to reduce late effects. Previously published data for the histological subtype (favorable histology) together with our data suggest that a total dose of 30 Gy applied with 5 fractions of 1.5 Gy/week over 4 weeks both takes into account the vulnerability of the growing brain and also is an adequate dose for local tumor control of resected brain metastases.

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